

operated and blasting operations conducted in accordance with Mine Safety and Health Administration (MSHA) regulations as set forth in 30 CFR Subpart N.

Other explosives required for the mining operation include detonating cord, which connects to each blast hole and fires a detonator, initiating the explosion in each blast hole. The detonators, in turn, fire explosive primers, which propagate the explosion to the blasting agent. Small amounts of pre-packaged blasting agents and minor amounts of other explosives may be used for specific purposes.

3.6.4. Reagents

Reagents will arrive at the mine site by truck in 20-ton containers, depending on the reagent. They will be stored in a secure bulk reagent storage area and segregated according to compatible characteristics. The reagent storage area will be sufficient to maintain a two-month supply at the mine site. As needed, reagents will be loaded onto a truck and delivered to the appropriate reagent receiving area.

Reagents will be used in very low concentrations throughout the mineral processing plant and are primarily consumed in the process; low residual reagent quantities remain in the tailings stream and will be disposed in the TSF where they will be diluted and decompose.

The metallurgical and assay laboratories will also use small amounts of reagents. Any hazardous reagents imported for testing will be transported, handled, stored, reported, and disposed of as required by law, in accordance with manufacturers' instructions, and consistent with industry best practices.

3.7. WASTE MANAGEMENT AND DISPOSAL

3.7.1. Used or Damaged Parts

Used tires and rubber products will be reused to the extent practicable. Additional used tires, along with other damaged parts and worn pipes, will be packaged for shipment and disposal off site. Wood pallets and packaging will be incinerated with domestic waste. Scrap steel, such as broken grinding balls and used mill liners, truck body liners and ground engaging tools, will be shipped off-site to appropriate disposal sites.

3.7.2. Laboratory Waste

Most inorganic aqueous wastes from the metallurgical and assay laboratories will be collected in a sump, with the remainder routed to the domestic sewage treatment plant. Fugitive organics will be skimmed from the surface of the sump prior to discharging the aqueous portion to the main WMP. Generally, non-aqueous waste will be collected in specific and separate bulk containers before being returned to an appropriate place in the plant. If there is no suitable place in the main plant, it will be sent to the general waste storage area where it will be packaged and sent off site for disposal at an appropriate facility.

3.7.3. Waste Oils

Waste oil will be reused as fuel in used oil heaters to augment heating in the truck shop and/or other buildings on site. Waste oils not suitable for burning, including lubricants, will be collected into drums, sealed, and stored in containers for shipment to be recycled or disposed of off-site at an approved facility.

3.7.4. Container Wash Wastewater

Water from the container wash at site will be routed to the main WMP for use in the mill and processing plan or treated for discharge.

3.7.5. Reagent Packaging

Reagent packaging will include wooden boxes, bulk poly-propylene containers, bulk bags, laboratory packaging, and/or glass containers. Spent reagent packaging will be evaluated against applicable regulations, permits and health and safety plans for possible incineration in the on-site incinerator. Glass containers will be rinsed and packed for removal and disposal off site. Broken sharp products will be collected and packaged appropriately for removal and disposal off site.

3.7.6. Hazardous Waste

Miscellaneous hazardous wastes that may accumulate on site, such as paint, used solvents, and empty reagent containers with residual chemicals, will be managed and shipped off site to approved facilities according to applicable BMPs and regulations.

3.7.7. Nuclear Instrumentation

Nuclear instrumentation such as densitometers will be shipped off site to approved facilities in accordance with applicable BMPs and regulations.

3.7.8. Domestic Refuse

Domestic refuse from the camp kitchen, living quarters, and administration block will be disposed of on site in a permitted landfill, or shipped off-site to appropriate disposal sites. Some wastes, including putrescible wastes, will be incinerated on site, and the remaining ashes will be disposed of in accordance with applicable BMPs and regulations.

3.7.9. Sewage and Domestic Wastewater Disposal

Separate sewage treatment plants will be located at the camp and the process plant. Plans for each plant will be reviewed and approved by ADEC prior to construction.

Personnel accommodations will produce grey water from the kitchen, showers, and laundry facilities that will be treated in a water treatment plant (WTP). The WTP will be designed to remove biological oxygen demand, total suspended solids (TSS), total phosphate, total nitrogen, and ammonia to meet ADEC domestic waste-discharge criteria.

The process plant sewage WTP will receive effluent that may have metallic residues from the workers' change house and associated laundry. This WTP will be designed for metals removal in addition to biological oxygen demand, TSS, total phosphate, total nitrogen, and ammonia to meet ADEC domestic waste-discharge criteria.

Sludge from both plants will be stabilized and disposed of on site.

3.8. TRANSPORTATION CORRIDOR

The Pebble Project mine site is located approximately 82 miles west of Cook Inlet. There are limited existing road networks in the region. The transportation corridor will extend 82 miles from Diamond Point to the mine site along the north shore of Iliamna Lake.

The transportation corridor was designed to avoid wetlands where feasible, minimize disturbance area, minimize stream crossings, avoid geological and avalanche hazards, avoid culturally significant sites, minimize effects on subsistence hunting and gathering, optimize the alignment for the best soil and geotechnical conditions, and minimize road grades.

The mine access road will run east from the mine site to the port site at on Cook Inlet at Diamond Point. It will parallel or replace portions of the existing Pile Bay/Williamsport road and intersect with the existing Iliamna/Newhalen road network (Figure 12).

The concentrate, water return, and gas pipelines and the fiber optic cable will be buried in a corridor adjacent to the road that parallels the road from the mine site to the port.

3.8.1. Road Design

The mine access road will be a private 30-foot-wide gravel road, which will enable two-way traffic, and will be capable of supporting anticipated development and operational activities during construction and supply truck haulage from the port to the mine site.

The access road will include seventeen bridges, eight of which will be single-span, two-lane bridges that range in length from approximately 40 to 90 feet. There will be one large (550 feet) multi-span, two-lane bridge across the Newhalen River and eight other multi-span, two-lane bridges that range in length from approximately 125 to 245 feet. Road culverts at stream crossings are divided into categories based on whether the streams are fish bearing. Culverts at streams without fish will be designed and sized for drainage only, in accordance with ADOT&PF standards. Culverts at streams with fish will be designed and sized for fish passage in accordance with ADOT&PF standards and will meet USFWS guidelines (Culvert Design Guidelines for Ecological Function, U.S. Fish and Wildlife Service Alaska Fish Passage Program, Revision 5, February 5th, 2020).

The natural gas pipeline, concentrate pipeline, water return pipeline, and fiber optic cable will be buried in a corridor adjacent to the access road. For bridged river crossings, the pipelines will be attached to the bridge structures.

3.8.2. Concentrate and Water Return Pipelines

The concentrate pipeline will consist of a single approximately 6.25-inch diameter API 5L X60 grade (or similar) steel pipeline with an internal HDPE liner to prevent corrosion. A cathodic protection (zinc ribbon or similar) system will be included for prevention of external corrosion. A pressure-based leak detection system, with pressure transmitters located along the pipeline route, will monitor the pipeline for leaks. Two electric pump stations will be required, one at the mine site and one at an intermediate point. Both pump stations will utilize positive displacement pumps in the 1000 horsepower range and the intermediate one will require a power generation facility (1-2-megawatt range). Rupture discs at the intermediate and terminal stations and pressure monitoring will be utilized to protect the pipeline from overpressure events. Manual isolation and drain valves will be located at intervals no greater than 20 miles apart.

The return water pipeline is sized to accommodate water from flushing operations with a diameter of approximately 8 inches. The HDPE lined steel pipeline will have similar corrosion protection and safety controls to the concentrate pipeline. No intermediate pump station is required for the water return pipeline.

3.8.3. Transportation Corridor Traffic

To facilitate efficient cargo movement most material will be transported in shipping containers. Inbound Project cargo and consumables will be transported using standard ISO containers for ocean freight (either 20- or 40-foot size). Diesel fuel will be transferred from the Diamond Point Port to the mine site using ISO tank-container units, which have a capacity of 6,350 gallons. Truck/trailer units will be designed to haul up to three loaded containers per trip.

Daily transportation of fuel, reagents and consumables will require up to 18 round trips per day for each leg of the road, including three loads of fuel per day.

3.9. DIAMOND POINT PORT AND LIGHTERING LOCATION

Incoming supplies such as equipment, reagents, and fuel will be barged to the Diamond Point Port and then transported by truck to the mine site. To a lesser extent, some supplies, such as perishable food, may be transported by air to the Iliamna Airport and trucked to the mine site. Bulk concentrate will be lightered by barges to Handysize bulk carriers at a mooring point located in Iniskin Bay. The port facilities layout is shown in Figure 1-5. The proposed lightering location is also shown in Figure 1-5.

The Diamond Point Port will include shore-based facilities to dewater, store, and load the copper-gold concentrate, a pumping station for the water return pipeline, facilities to receive and store containers and fuel, as well as natural gas-powered generators, maintenance facilities, employee accommodations, and offices.

The marine component includes a causeway extending out to a marine jetty located in an 18-foot deep dredged basin. A dredged access channel will lead to deep water. Concentrate will be transferred from the shore-based facilities to the barge loader using an enclosed conveyor that

follows the road before transitioning onto the causeway and jetty. Fuel will be pumped from fuel barges to the on-shore storage tanks using an 8-inch pipeline.

3.9.1. Dredging Plan

A 1994 USACE dredging study was completed for the evaluation of a dredged access channel and port facility at Williamsport. PLP completed a bathymetric survey of the Iliamna Bay area in 2008. The information from the USACE report and the bathymetric survey data were used to inform the dredge planning and design.

Based on available geophysical data bedrock in the vicinity of the dredged channel and basin occurs at depths greater than 100 feet, well below the proposed dredge depth. Sediments are expected to be composed of greater than 70% fines, with the remainder consisting of sand and gravel. Dredge slopes of 4H:1V are proposed to address sediment stability and the potential for seismic induced slumping.

Draft requirements for the concentrate and supply barges and tugs used during construction and operations are 15 feet. The dredged depth for the access channel and turning basin is 18 feet below Mean Lower Low Water (MLLW) to provide access to the jetty under all tidal conditions. This allows an additional three feet to accommodate for accumulated sedimentation between forecast maintenance dredging (estimated at 20 inches over 5 years) and over depth excavation.

The channel will be approximately 2.9 miles in length and 300 feet wide (3 times the maximum expected barge width), while the turning basin will incorporate an area of approximately 1,100 feet by 800 feet. The total volume of dredged material for the initial dredging is estimated at 1,100,000 cubic yards. Maintenance dredging (estimated at 20 inches every 5 years) is expected to total 700,000 cubic yards over twenty years (four times).

Dredging will be accomplished using a barge mounted cutterhead suction dredge. Dredged material would either be pumped directly to shore from the dredge barge, or placed into a small barge (200 ft x 40 ft) and hauled to shore. The dredged material will be placed into two bermed stockpiles located in uplands adjacent to the port facility. Consolidation and runoff water would be channeled into a sediment pond and suspended sediments would be allowed to settle before discharge to Iliamna Bay. Boulders encountered during dredging would be removed using a grab bucket or cable net placed by divers and transported to shore for placement in the stockpiles or use in construction.

The proposed dredge channel and port facility is located approximately 1,700 feet to the west of the existing fiber optic cable and Williamsport access channel. Barges accessing Williamsport follow the naturally incised channel north towards the head of Iliamna Bay before turning west towards the dredged Williamsport landing basin and dredging operations will not impede access to the facility. Activities will also be located north of the access corridor to the existing Cottonwood Bay gravel mining operation and would not impede access to that facility. Marine vessels not in active use for construction and dredging would be anchored in deeper water west of the main passage into the bay or moved offsite to avoid impeding access. Initial dredging of the facility is expected to commence in May of the second year of construction and will take four to six months

to complete. Maintenance dredging will take place at five-year intervals and is expected to last three to four weeks. Maintenance dredging would be completed during the early summer months.

3.9.2. Port Design

The Diamond Point Port will include shore-based facilities to dewater, store, and load the copper-gold concentrate, a pumping station for the water return pipeline, facilities to receive and store containers and fuel, as well as natural gas powered generators, maintenance facilities, employee accommodations, and offices.

The marine component includes a causeway extending out to a marine jetty located in the 18-foot deep dredged basin. The jetty will be constructed along the northern and western limits of the basin and consist of 120 x 60 foot concrete caissons up to 58 feet high that would be separated by 60 feet. The caissons will be covered with a concrete deck. Fuel and freight barges will be moored to the jetty for loading and unloading. Fuel will be pumped to the storage tanks located at the shore-based facility through an 8-inch pipeline. The concentrate conveyor will be located on the causeway and jetty deck. In addition to the jetty, a series of three caissons will be placed within the dredged basin to provide mooring and loading for the concentrate lighter barges. A gantry will support an enclosed conveyor from the jetty to a barge loader mounted on the caissons. The causeway will also be constructed using concrete caissons to support a concrete deck.

To prepare for caisson placement, the basin footprint under the caissons will be excavated and leveled to a depth of approximately 5 feet below the dredged basin or seabed using a barge mounted excavator. The caissons would then be floated into place using a tug for guidance at high tide and seated on the leveled seabed on the falling tide or slowly lowered by pumping water into the caisson. Cranes may be used to place caissons in shallower water. Once set in place, the caissons would be filled with coarse material from the dredging and additional quarried material of a size that would achieve proper compaction when filled to avoid settlement over time. The additional fill material would be sourced from onshore material sites. Fill would be transported from shore to the caissons using a barge. Initially, only enough fill would be placed into the caisson to achieve proper seating, avoiding displacement and overflow of any water within the caisson. Fill materials would be stored temporarily on a barge moored adjacent to the construction area. Any water accumulated within the caisson would be pumped out to avoid saturation in the top fill layers and, if necessary, run through tanks on a barge for sediment settlement before discharge into the marine environment. Pre-cast bridge beams (T-sections) would be placed on the caissons to create the main service deck and the access trestle. These pre-cast beams would then be tied together with rebar and topped with a cast-in-place concrete deck for the final surface. For the shore transition, concrete pedestals would be constructed from shore to support the final bridge beams leading to the causeway. At the dock area, the caissons would be used to mount the fendering system and barge ramp equipment for the marine operations.

Construction the dock and causeway would take place following completion of the dredging and would occur late in the summer/fall of the second year of construction.

3.9.3. Port Operations

Copper-gold concentrate will be transferred from the mine site to the Diamond Point Port by concentrate pipeline, then dewatered at the port site, and stored between vessel sailings in a dedicated concentrate storage building. The concentrate will be transported by an enclosed conveyor to a barge loader that will load lightering barges with approximately six thousand tons of concentrate. The two lightering barges will have dust covers to control dust emissions. Once loaded, the barges will be transported to and secured against Handysize size vessels at the mooring location in Iniskin Bay. Wheel loaders will reclaim the concentrate from the barge deck and transfer it to a ship loader, which will load the ships. The barge location will be adjusted along the ship during the loading process. The loading trunk will extend down into the hold of the ship to minimize dusting and mist sprays will be utilized to further control dust generation. Due to the high density of the concentrate the holds will not be loaded to the top, further reducing any potential for concentrate dust to escape the hold. About five to six trips by the lightering barges will be required to load a bulk carrier, which would be anchored for three to four days at the lightering location. The bulk carrier ships will transport the concentrate to out of state smelters.

Up to 27 Handysize ships will be required annually to transport concentrate. Up to 33 marine line-haul barge loads of supplies and consumables will be required annually. Two ice-breaking tugboats will be used to support marine facility operations.

3.10. NATURAL GAS PIPELINE

Natural gas will be supplied to the Diamond Point Port and the mine site by pipeline (Figure 1-1). The pipeline will connect to the existing gas pipeline infrastructure near Anchor Point on the Kenai Peninsula and will be designed to provide a gross flow rate of approximately 50 million standard cubic feet per day. A fiber optic cable will be buried in the pipeline trench or ploughed in adjacent to the pipeline.

A metering station will be constructed at the offtake point that connects to a compressor station located on a land parcel on the east side of the Sterling Highway. The steel pipeline will be designed to meet all required codes and will be a nominal 12 inches in diameter.

The compressor station will feed a 75-mile subsea pipeline across Cook Inlet that will be constructed using heavy wall nominal 12-inch-diameter pipe designed to have negative buoyancy and provide erosion protection against tidal currents. Horizontal directional drilling will be used to install pipe segments from the compressor station out into waters that are deep enough to avoid navigation hazards. From this point, the heavy wall pipe will be trenched into the sea floor as required to maintain pipe integrity.

The pipeline will come ashore in Ursus Cove utilizing trenching, cross Ursus Head and Cottonwood Bay before reaching the port site north of Diamond Point. Natural gas will be fed to the port site power station and used for site heating. The distance from the Diamond Point Port to the mine site is approximately 82 miles. The pipeline will be buried with concentrate and water return pipelines in a trench adjacent to the road prism and will follow the mine access road to the

mine site. At bridged crossings the pipeline will be attached to the bridges, otherwise the pipeline will utilize trenching or horizontal directional drilling to cross streams.

Long-term corrosion protection and control will be provided by an external coating on the pipeline and components, combined with an impressed current and/or galvanic current cathodic protection system. The cathodic protection system will be installed and activated, as soon as is practical, after pipe installation to maximize the effect of corrosion protection. Metering stations and pig launching and receiving facilities would be located at the compressor station and offtake points as appropriate. Mainline sectionalizing valves will be installed as required by code, with a spacing of no more than 20 miles for the onshore sections of the pipeline.

4. WATER MANAGEMENT

PLP recognizes the importance of effectively managing water resources in the area surrounding the Pebble Deposit and will implement a comprehensive water management program that will minimize impacts to water flow and quality and will minimize and mitigate impacts associated with all waters affected or used by the Project.

4.1. MINE SITE

The main objective of water management at the mine site is to manage, in an environmentally responsible manner, water that originates within the project area while providing an adequate water supply for operations. A primary design consideration is to ensure that all contact water that requires treatment prior to release to the environment will be effectively managed. This includes carefully assessing the Project facility layout, process requirements, area topography, hydrometeorology, aquatic habitat/resources, and regulatory discharge requirements for managing surplus water. All runoff water contacting the facilities at the mine site and water pumped from the open pit will be captured to protect the overall downstream water quality.

4.1.1. Water Balance

The foundation of the water management program is the water balance. The Pebble Water Balance is comprised of three primary models: the Watershed Model, the Groundwater Model, and the Mine Plan Model. These three models, which are all numerical water balance models, are very different, yet complementary. They collectively provide the means of quantifying the numerous water flows in the streams, in the ground, and in the various pipes, ponds, and mine structures associated with the mine development. The Watershed Model focuses on water flows throughout the NFK, SFK, and UTC drainages. The Groundwater Model focuses on the detailed simulation and understanding of groundwater flows within those drainages, and serves to inform the watershed model, and vice versa. The Mine Plan Model focuses on mine site water inflows and uses.

Complementing the water balance models is an instream fish habitat-flow model, which was used to assess the effects of changes in water flow to the fish habitat in the adjacent streams.

4.1.1.1 Watershed Model

The Watershed Model for the NFK, SFK, and UTC drainages considers both surface and groundwater. This model incorporates all key components of the hydrologic cycle, including precipitation as rain and snow, evaporation, sublimation, runoff, surface storage, and groundwater recharge, discharge, and storage. The primary input is monthly precipitation and temperature data collected at the Iliamna Airport from 1942 through 2017. The model was calibrated to measured site flow data collected at various locations in all three drainages over a nine-year period. The Watershed Model also provided input for the instream fish habitat-flow model, as well as the initial boundary parameters associated with groundwater recharge and runoff conditions for the groundwater model.

4.1.1.2 Groundwater Model

The Groundwater Model focuses on the sub-surface movement of water within the NFK, SFK, and UTC drainages. It models hydrogeological conditions in a more sophisticated and detailed manner than the Watershed Model, and its outputs provide a check of reasonableness for the Watershed Model. In addition, the Groundwater Model simulates groundwater flow rates and groundwater-surface water interactions throughout the study area, whereas the Watershed Model considers surface and groundwater flow rates only at the streamflow gaging stations.

4.1.1.3 Mine Plan Model

The Mine Plan Model focuses on water movement within the Pebble Project footprint area. The Mine Plan Model is a site-wide water balance and considers all mine facilities including the bulk TSF, pyritic TSF, open pit, process plant, and the WMPs. This model tracks water movement throughout the Pebble Project footprint area including runoff from the mine facilities, water contained in the ore, groundwater inflows, evaporation and water stored in the tailings voids.

The Mine Plan Model is used to predict the flow regime on the mine site and whether there is a water surplus or deficit. It will also be used to estimate the water storage capacity requirements for the mine under normal operating conditions.

4.1.1.4 Physical Habitat Simulation System (PHABSIM) Instream-flow Model

The PHABSIM model is an integral component of the site water balance design and is used to determine the most effective way of releasing the treated contact water that is surplus to the project needs. This model assesses the effects of changes in water flow to the instream fish habitat in streams downstream of the project site. It quantifies the areal extent of specific habitat changes that result from changes in flow throughout the year:

- for each of the three streams in the area (NFK, SFK, and UTC),
- at multiple locations throughout the whole length of each stream,
- for different salmon and resident fish species within each stream, and
- for different life history stages of each species.

Output from the model, together with a consideration of site-specific fish production limiting factors, will be used to inform and optimize the discharge of water from the site to minimize the effects of reduced flow and/or enhance instream fish habitat below the discharge points.

4.1.2. Preproduction Phase

The water management and sediment control plan during the preproduction phase consists of multiple aspects that will focus on minimizing contact water volumes. Runoff and associated sediment control measures will be managed with BMPs and adaptive control strategies. Where water cannot be diverted, it will be collected, treated, and discharged.

4.1.2.1 Water Management Plan

The water management plan during the Preproduction Phase can be summarized as follows:

- Water diversion, collection, and treatment systems will be installed around the site to address the effect of construction ground disturbance.
- Water management and sediment control structural BMPs, including temporary settling basins and silt fences, will be installed to accommodate the initial mine site construction.
- Among the first permanent facilities to be constructed will be the water management structures that will be maintained for use in adaptive management during operations, such as diversion and runoff collection ditches to minimize water contact with disturbed surfaces, and sediment control measures such as settling ponds to stop sediment from reaching downstream water courses.
- Preproduction Phase mining cannot commence until the water table in the open pit area has been lowered by groundwater pumping. The open pit dewatering system will be installed prior to Preproduction Phase mining to provide sufficient time to draw down the water table in the area. This will allow uninterrupted overburden removal in preparation for production mining of mineralized material. A series of dewatering wells will be drilled into and around the perimeter of the open pit, with the exact well number and location determined by testing the overburden aquifers. The number of wells will include an allowance for wells with poor or no water yields and wells lost through sanding, equipment loss, or other interference with water production. Pump sizes for each well will be based on well-specific yields. Water will be discharged to the environment if it meets water quality criteria; otherwise, it will be treated in a water treatment plant prior to discharge.

Design considerations for the Preproduction Phase water management structures include the following:

- Diversion channels, berms, and collection ditches will be sized for the 100-year, 24-hour rainfall event.
- Diversion channels, berms, and collection ditches will be constructed with erosion-control features, such as geotextile or riprap lining, as appropriate, for site-specific condition. Energy dissipation structures, such as spill basins or similar control measures, will be included where required to reduce erosion at the outlets of the diversion channels and collection ditches.
- Sediment control ponds will be sized to attenuate and treat up to the 10-year, 24-hour rainfall event volume and to safely manage the 100-year, 24-hour rainfall event.
- Water management and sediment control ponds will be constructed using non-PAG rock and earthen fill embankments.

- A temporary cofferdam will be constructed upstream of the main TSF embankment to manage water during the initial construction phase. Runoff from the undisturbed upstream catchment will be collected behind the cofferdam will be pumped downstream of all construction activities and released within the same watershed.

4.1.2.2 Water Treatment

Minimal water storage will be available on site until initial construction activities are completed. Therefore, prior to completion of the TSF embankments and water management structures, all water that does not meet water quality standards will be treated and released. Water from the following sources and activities may require treatment prior to release:

- Preproduction Phase pit dewatering (dewatering of the overburden aquifer near the pit may require treatment).
- Water, primarily from precipitation, accumulating in the open pit during Preproduction Phase mining.
- Runoff from TSF embankment construction.
- Runoff from excavation for site infrastructure such as the process plant, camps, power plant, or storage areas will be routed to settling ponds prior to release.
- Prior to the operations WTPs being brought on-line, modular WTPs will be used to treat contact water that does not meet discharge requirements.

4.1.3. Production Phase

The water management and sediment control plan during the Production Phase focuses on minimizing contact water. Runoff and associated sediment control measures will be managed with BMPs and adaptive control strategies. Where water cannot be diverted, it will be collected for use in the mining process or treated and discharged.

4.1.3.1 Water Management Plan

The water management plan during the Production Phase can be summarized as follows (Figure 4-1 shows a simplified schematic of the site water balance):

- Water collected from the pit dewatering wells and the open pit will be pumped to the open pit water management pond (WMP). From there, water will be pumped to the open pit WTP for treatment and discharge. WTP sludge will be directed to the process plant where it will be added to the pyritic TSF via the pyritic tailings slurry line.
- Bulk tailings slurry from the mill will be directed to the bulk TSF. Additionally, precipitation and runoff water will collect in the TSF. The bulk TSF will maintain a small operating pond.

- The main bulk TSF embankment will operate as a flow-through facility. Water collecting in the bulk tailings storage cell will flow through the embankment to the main embankment seepage collection pond. From there, water will either be directed to the main WMP for use in the mill or to the main WTP for treatment and discharge. Any excess surface water in the bulk tailings TSF will be pumped to the main WMP.
- Contact water will be pumped to the main WMP. Water treatment by-product sludge and reject water will be directed to the process plant and added to the pyritic TSF via the pyritic tailings slurry line. A portion of the treated water from the main WTP will be returned for use in the process plant and power plant cooling towers.
- Pyritic tailings slurry from the mill will be directed to the lined pyritic TSF. Additionally, precipitation and runoff water will collect in the pyritic TSF. A pond will be maintained in the pyritic TSF, fully submerging the pyritic tailings and all but the upper lift of the PAG waste rock. Excess water from the pyritic TSF will be pumped to the main WMP.
- A water surplus for the Production Phase is anticipated under normal and wetter-than-normal climatic conditions. Although the mine site will have a water surplus, the water volume available to discharge will be less than the pre-mine flows within the mine footprint as some water will be consumed in the tailings voids and some will be lost to evaporation and other minor uses. The site water surplus will vary during operations as the mine footprint expands and additional site runoff is collected. Surplus water will be treated and discharged throughout the year.
- The accuracy of water balance models is limited by many factors, including the stochastic nature of the inputs and the potential effects of climate change. In recognition of these limitations, an adaptive water management strategy is planned. Adaptive water management includes the ability to provide additional temporary water storage capacity in the TSFs, to provide surplus storage capacity within the WMPs, and to provide for expansion of the WTP treatment rate by building in excess capacity. In addition to the redundancy built into the pumping and treatment systems, additional storage capacity is available under extreme flood conditions by directing water to the open pit, allowing it to flood until the pumping and treatment systems can restore the water stored in the system to its design level.
- A comprehensive water management system will be implemented to monitor water quantity and quality. All discharged waters will be monitored for compliance with state and federal permit requirements. Water from both water treatment plants will be strategically discharged to optimize fish habitat in the downstream reaches of nearby streams. Discharge locations for the treated water have been identified in the NFK, SFK, and UTC. The treated water discharge will be distributed to these locations in a manner that optimizes downstream aquatic habitat conditions. Optimal conditions will be determined using a PHABSIM habitat instream-flow

model and in accordance with ADEC and Alaska Department of Fish and Game (ADF&G) permit conditions.

Design considerations for the Production Phase water management include the following elements:

- Diversion channels, berms, and collection ditches will be sized for the 100-year, 24-hour rainfall event.
- Diversion channels, berms, and collection ditches will be constructed with erosion-control features, such as geotextile or riprap lining, as appropriate, for site-specific conditions. Energy dissipation structures, such as spill basins or similar control measures, will be included where required to reduce erosion at the outlets of the diversion channels and collection ditches.
- Sediment control ponds will be sized to attenuate and treat up to the 10-year, 24-hour storm event volume and to safely manage the 100-year, 24-hour rainfall event.
- Water management and sediment control ponds will be constructed using non-mineralized rock and earthen fill embankments.
- IDF for all WMPs will be the 100-year, 24-hour rainfall event; IDF for the TSFs and main WMP will be the 24-hour PMP plus the 100-year snowpack equivalent water volume.
- Surplus water will be treated to meet the specified water quality criteria prior to discharge.

Water collection, management, and transfer will be accomplished through a system of water management channels, ponds, and pump and pipeline configurations. These systems will be designed to handle the large flows that occur during spring freshet and late summer/fall rains. Spare parts for pump systems will be maintained on site to maintain continuous and effective water management. Leak detection systems that report to a central control system will be employed, as will monitoring systems to control pump cycling, high and low water-level switches, no-flow (or low-flow) alarms, vibration overheating alarms, and other systems as appropriate to monitor water management systems.

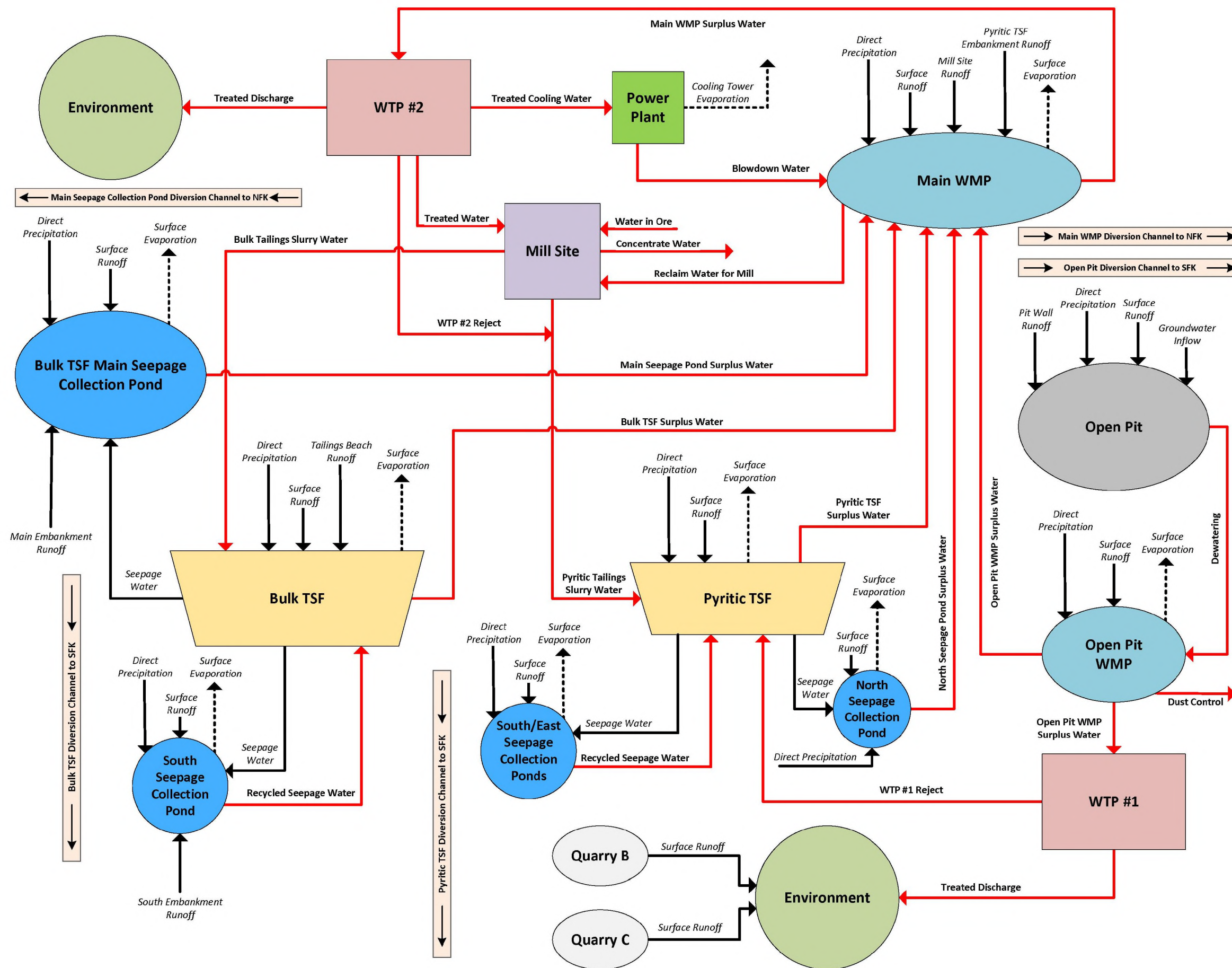
Figure 4-1

Water Balance Flow Schematic - Operations

Pumped Flow Pathway

Runoff, Groundwater, or Seepage Pathway

Evaporation



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4.1.3.2 Water Treatment

Water collected around the mine area will require treatment prior to discharge to the environment. Treatment methods will include a mixture of settling for sediment removal, chemical additions to precipitate dissolved elements, and filtration to meet final discharge criteria. Wastewater from the personnel camp at the Diamond Point Port site will also require treatment prior to discharge.

The mine area will have two water treatment plants: WTP #1 (the open pit WTP) and WTP #2 (the main WTP). Both will be constructed with multiple, independent treatment trains, which will enable ongoing water treatment during mechanical interruption of any one train.

Water Treatment Plant #1

WTP #1 will treat water from the open pit WMP with treatment plant processes commonly used in the mining industry around the world. Figure 4-2 shows a simplified schematic of the treatment process. Major treatment steps are outlined in sequence below.

1. Dissolved metals will be oxidized with potassium permanganate, followed by co-precipitation with ferric chloride. Hydrochloric acid or lime will be added as needed to maintain the water pH for optimal precipitation.
2. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Clarifier solids will be thickened and transferred to the pyritic TSF.
3. Clarified water will then be treated with sodium hydrogen sulfide, lime, and ferrous chloride to further precipitate remaining metals under reducing conditions.
4. Water from the sulfide reaction tanks will be filtered with sand filters and Ultrafiltration (UF) membranes to remove precipitated metals. Backwash from the sand filters and UF membranes will be thickened and transferred to the pyritic TSF.
5. A portion of the UF membrane permeate water will be treated with four stages of reverse osmosis (RO) membranes to further remove TDS to a concentration that will be safely below the discharge limit. Permeate from the RO membranes will be recombined with the main effluent stream for discharge to the environment.
6. Reject brine from the RO membranes will be transferred to the pyritic TSF.

Water Treatment Plant #2

WTP #2 will treat water from the main WMP with treatment plant processes commonly used in the mining industry around the world. Figure 4-3 shows a simplified schematic of the treatment process. Key treatment steps occur in the following sequence:

1. Dissolved metals will be oxidized with potassium permanganate, followed by co-precipitation with ferric chloride. Hydrochloric acid or lime will be added as needed to maintain the water pH for optimal precipitation.

2. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Most of the solids from the clarifiers will be recycled back to the oxidation reaction tanks. The balance of clarifier solids will be thickened and transferred to the pyritic TSF.
3. Clarified water will then be treated with sodium hydrogen sulfide, lime, and ferrous chloride to further precipitate remaining metals under reducing conditions.
4. Water from the sulfide reaction tanks will be filtered with sand filters and UF membranes to remove precipitated metals. Backwash from the sand filters and UF membranes will be thickened and transferred to the pyritic TSF.
5. RO membranes will provide additional metals and metalloids removal as well as removal of TDS and sulfate. Permeate from the RO membranes may require alkalinity adjustment prior to discharge.
6. Reject from the RO membranes will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the mine water balance with dissolved sulfate, sulfate will be precipitated from the reject before transferring to the pyritic TSF. Sulfate from the RO reject will be precipitated as calcium sulfate with a lime softening process. The calcium sulfate sludge will be transferred to the pyritic TSF. Based on the expected pH in the pyritic TSF, the calcium sulfate sludge is not expected to re-dissolve.
7. Supernatant from the calcium sulfate precipitation process will contain high levels of TDS and dissolved sulfate, a portion of which will need to be removed from the WTP process to avoid continual buildup. The supernatant water will be filtered with UF membranes. UF backwash will be sent to the sludge thickener. UF permeate will be sent to brine concentration RO membranes. Brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged.
8. Reject from the brine concentration RO membranes, which will still be a relatively high flow of water with high TDS and dissolved sulfate, will be further processed with a two more identical stages of calcium sulfate precipitation by lime softening, UF membrane filtration, and brine concentration RO membranes. All brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged. Brine from the last stage of RO membranes will be transferred to the pyritic TSF.

FIGURE 4-2

Water Treatment Plant #1

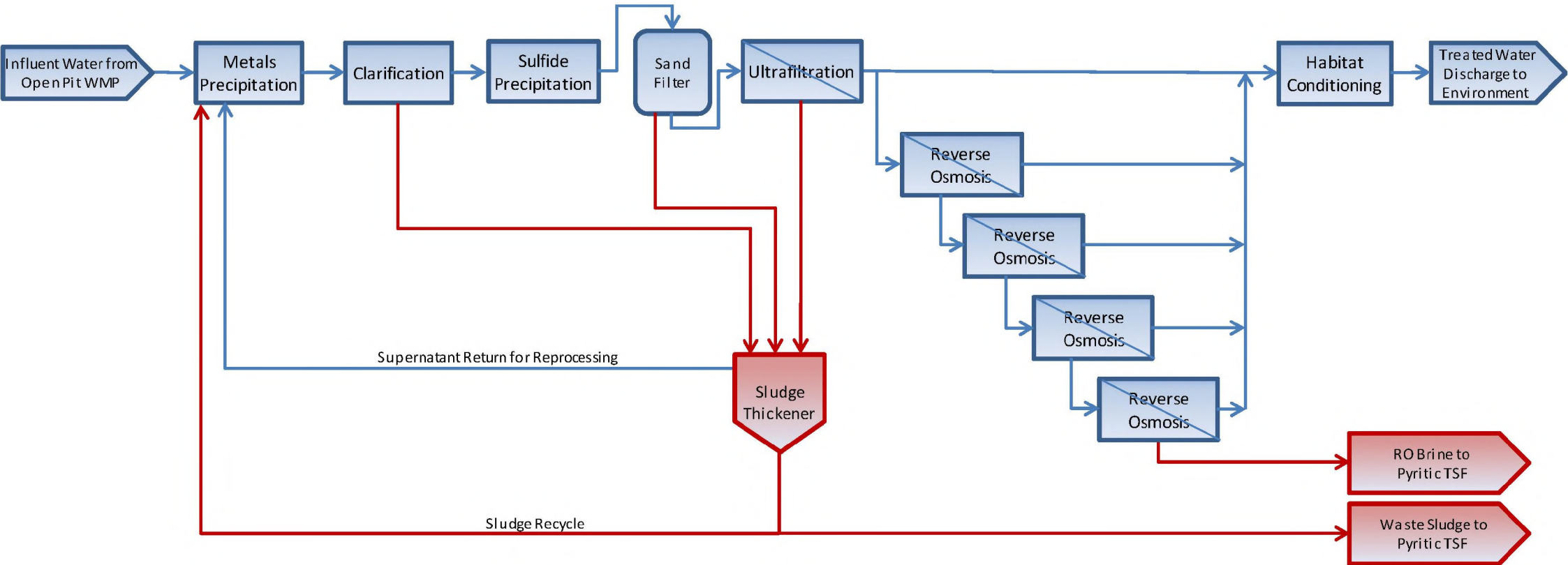
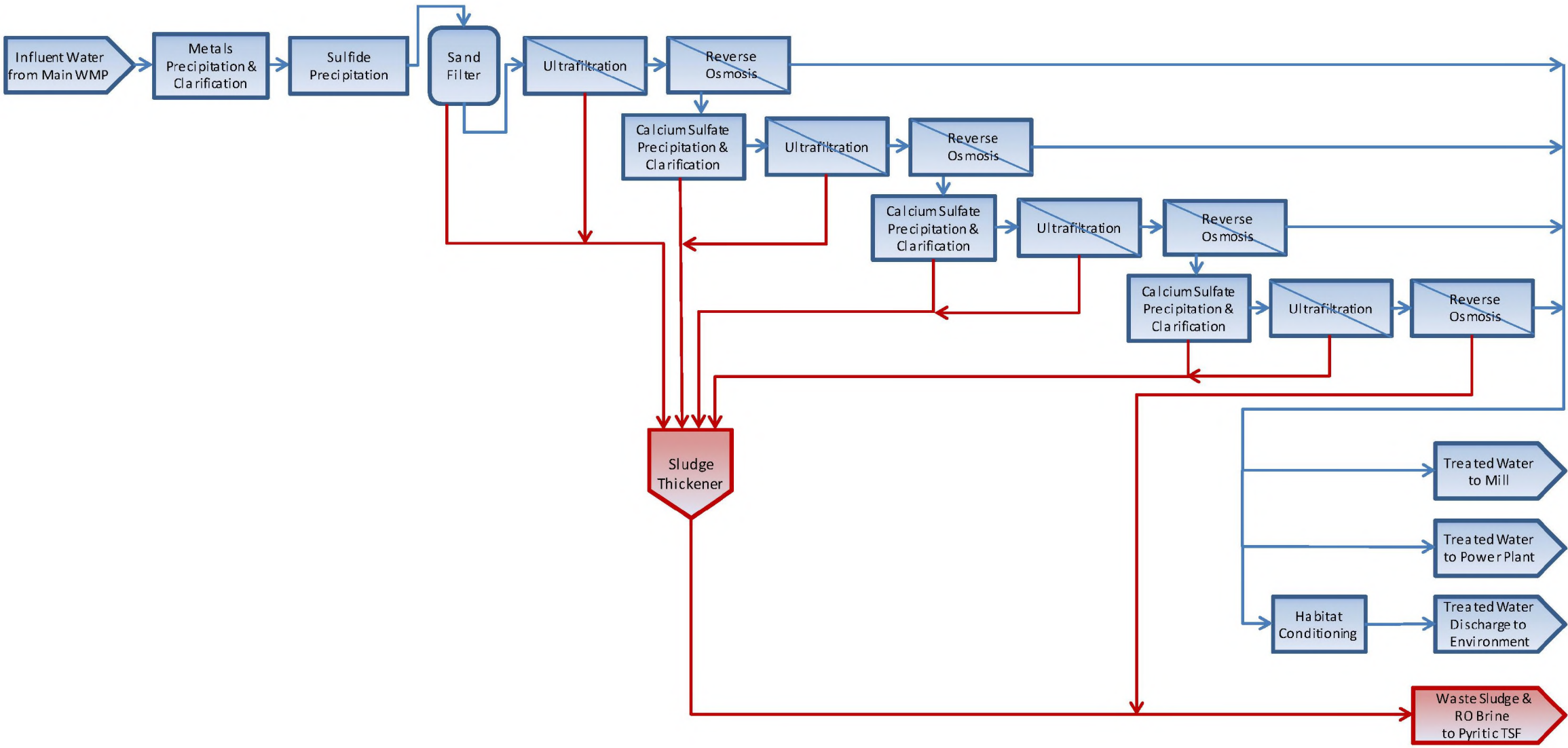


FIGURE 4-3

Water Treatment Plant #2:
Operations Phase



4.1.4. Closure/Post-Closure Phase

Closure and post-closure water management addresses both the immediate physical closure of the site and associated reclamation activities, as well as the long-term post-closure period and associated maintenance and monitoring activities. Additional details on reclamation and closure are provided in Section 6.

4.1.4.1 Water Management Plan

The water management plan during the closure and post-closure phases can be summarized as follows:

- Closure Phase 1: Years 0-15
 - WTP #3 replaces WTP #1 to treat open pit water.
 - Excess and seepage water from the bulk TSF is pumped to the main WMP.
 - Seepage water from the pyritic TSF is pumped to the main WMP.
 - Surplus water from the main WMP is treated at WTP #2 and released to the downstream environment.
 - Surplus water from the open pit is pumped to WTP #3 to maintain the placement of the PAG waste rock in the dry.
 - Treated water from WTP #3 is released to the downstream environment
 - The open pit WMP is reclaimed.
- Closure Phase 2: Year 16 until the pit is full (approximately Year 20).
 - WTP #2 is decommissioned once it is no longer required.
 - The pyritic TSF and associated seepage collection ponds are reclaimed and surface water runoff from the area is discharged to the downstream environment.
 - The main WMP is reclaimed and surface water runoff from the area is discharged to the downstream environment.
 - Bulk TSF and seepage collection pond water is pumped to the open pit.
 - The open pit fills to the maximum management level.
 - The basis for the current analysis is that no water will be treated during this phase, however an adaptive management strategy would be utilized, and water would be directed to WTP #3 for treatment and release if required to maintain downstream flows.
- Closure Phase 3: Year 20 until the bulk TSF consolidation is complete (approximately Year 50).
 - Bulk TSF seepage is directed to WTP #3.
 - Water levels in the open pit are maintained below the main management level by treating and releasing surplus water from the open pit.

- Post-Closure
 - Runoff water is directly discharged from the reclaimed bulk TSF to the NFK catchment once it has been demonstrated to meet water quality criteria.
 - Bulk TSF seepage water is directed to WTP #3.
 - Water levels in the open pit are maintained below the main management level by treating and releasing surplus water from the open pit.

4.1.4.2 Water Treatment

Water treatment during the closure and post-closure phases will utilize the facilities as outlined below. Water quality will be closely monitored, and changes and adjustments to the treatment process will be made as needed. The reclamation and closure bond package will include provisions for periodic replacement of water treatment facilities and ongoing operating and monitoring costs over the long-term, post-closure period.

Water Treatment during Closure Phase 1

The mine area will have two water treatment plants during Closure Phase 1: WTP #2 and WTP #3. Both will have multiple, independent treatment trains, which will enable ongoing water treatment during mechanical interruption of any one train.

Water Treatment Plant #2 - Closure Phase 1

During Closure Phase 1 WTP #2 will treat water from the main WMP with treatment plant processes commonly used in the mining industry around the world. Figure 4-4 shows a simplified schematic of the treatment process. Key treatment steps occur in the following sequence:

1. Dissolved metals will be oxidized with potassium permanganate, followed by co-precipitation with ferric sulfate. Hydrochloric acid or lime will be added as needed to maintain the water pH for optimal precipitation.
2. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Most of the solids from the clarifiers will be recycled back to the oxidation reaction tanks. The balance of clarifier solids will be thickened and transferred to the open pit.
3. Clarified water will then be treated with sodium hydrogen sulfide, lime, and ferrous sulfate to further precipitate remaining metals under reducing conditions.
4. Water from the sulfide reaction tanks will be filtered with sand filters and UF membranes to remove precipitated metals. Backwash from the sand filters and UF membranes will be thickened and transferred to the open pit.
5. RO membranes will provide additional metals and metalloids removal as well as removal of TDS and sulfate. Permeate from the RO membranes may require alkalinity adjustment prior to discharge.

6. Reject from the RO membranes will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the mine water balance with dissolved sulfate, sulfate will be precipitated from the reject before transferring to the open pit. Sulfate from the RO reject will be precipitated as calcium sulfate with a lime softening process. The calcium sulfate sludge will be transferred to the open pit. Based on the expected pH in the open pit, the calcium sulfate sludge is not expected to re-dissolve.
7. Supernatant from the calcium sulfate precipitation process will contain high levels of TDS and dissolved sulfate, a portion of which will need to be removed from the WTP process to avoid continual buildup. The supernatant water will be filtered with UF membranes. UF backwash will be sent to the sludge thickener. UF permeate will be sent to brine concentration RO membranes. Brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged.
8. Reject from the brine concentration RO membranes, which will still be a relatively high flow of water with high TDS and dissolved sulfate, will be further processed with a two more identical stages of calcium sulfate precipitation by lime softening, UF membrane filtration, and brine concentration RO membranes. All brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged. Brine from the last stage of RO membranes will be transferred to the open pit.

Water Treatment Plant #3- Closure Phase 1

During Closure Phase 1 WTP #3 will treat water from the open pit with treatment plant processes commonly used in the mining industry around the world. Figure 4-5 shows a simplified schematic of the treatment process. Key treatment steps occur in the following sequence:

1. Dissolved metals will be oxidized with potassium permanganate, followed by co-precipitation with ferric sulfate. Hydrochloric acid or lime will be added as needed to maintain the water pH for optimal precipitation.
2. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Most of the solids from the clarifiers will be recycled back to the oxidation reaction tanks. The balance of clarifier solids will be thickened and transferred to the open pit.
3. Clarified water will then be treated with sodium hydrogen sulfide, lime, and ferrous sulfate to further precipitate remaining metals under reducing conditions.
4. Water from the sulfide reaction tanks will be filtered with sand filters and UF membranes to remove precipitated metals. Backwash from the sand filters and UF membranes will be thickened and transferred to the open pit.

5. Nanofiltration (NF) membranes will provide additional metals and metalloids removal as well as removal of TDS and sulfate. Permeate from the NF membranes may require alkalinity adjustment prior to discharge.
6. Reject from the NF membranes will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the mine water balance with dissolved sulfate, sulfate will be precipitated from the reject before transferring to the open pit. Sulfate from the NF reject will be precipitated as calcium sulfate with a lime softening process. The calcium sulfate sludge will be transferred to the open pit. Based on the expected pH in the open pit, the calcium sulfate sludge is not expected to re-dissolve.
7. Supernatant from the calcium sulfate precipitation process will contain high levels of TDS and dissolved sulfate, a portion of which will need to be removed from the WTP process to avoid continual buildup. The supernatant water will be filtered with UF membranes. UF backwash will be sent to the sludge thickener. UF permeate will be sent to brine concentration RO membranes. Brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged.
8. Reject from the brine concentration RO membranes, which will still be a relatively high flow of water with high TDS and dissolved sulfate, will be further processed with a two more identical stages of calcium sulfate precipitation by lime softening, UF membrane filtration, and brine concentration RO membranes. All brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged.
9. Brine from the last stage of RO membranes will be evaporated. The concentrated liquid brine stream from the evaporators will be sent to crystallizers. The crystallized salt stream from the crystallizers will be sent to centrifuges to remove any excess liquid from the salt crystals and that liquid will be returned to the crystallizers for reprocessing. The crystallized salt from the centrifuge, which will be primarily sodium chloride, will be sent to an approved facility for disposal. The water vapor from the evaporators and crystallizers will be condensed and the resulting liquid water will be discharged.

Water Treatment during Closure Phase 2

Closure Phase 2 is a period of approximately 5 years during which inflow to the Open Pit will not be removed, allowing the water level to rise to the Maximum Management Level and no surplus water will be treated. WTP #3 will be maintained in standby status but not operated during Closure Phase 2.

Water Treatment during Closure Phase 3 and Post Closure

During Closure Phase 3 and Post Closure WTP #3 will treat two streams of water separately: a stream from the Bulk TSF Main Seepage Collection Pond (SCP) and a stream from the open pit.

WTP #3 will use treatment plant processes commonly used in the mining industry around the world. The treatment processes utilized for each stream are described separately below:

Water Treatment Plant #3- Closure Phase 3 and Post Closure - Bulk TSF Main SCP Stream

Figure 4-6 shows a simplified schematic of the treatment process for the Bulk TSF Main SCP Stream within WTP #3 during Closure Phase 3 and Post Closure. Key treatment steps occur in the following sequence:

1. Dissolved metals will be oxidized with potassium permanganate, followed by co-precipitation with ferric chloride. Hydrochloric acid or lime will be added as needed to maintain the water pH for optimal precipitation.
2. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Most of the solids from the clarifiers will be recycled back to the oxidation reaction tanks. The balance of clarifier solids will be thickened and transferred to the open pit.
3. Clarified water will then be treated with sodium hydrogen sulfide, lime, and ferrous chloride to further precipitate remaining metals under reducing conditions.
4. Water from the sulfide reaction tanks will be filtered with sand filters and UF membranes to remove precipitated metals. Backwash from the sand filters and UF membranes will be thickened and transferred to the open pit.
5. NF membranes will provide additional metals and metalloids removal as well as removal of TDS and sulfate. Permeate from the NF membranes may require alkalinity adjustment prior to discharge.
6. Reject from the NF membranes will have a high concentration of dissolved sulfate and other divalent ions. To prevent overloading the mine water balance with dissolved sulfate, sulfate will be precipitated from the reject before transferring to the open pit. Sulfate from the NF reject will be precipitated as calcium sulfate with a lime softening process. The calcium sulfate sludge will be transferred to the open pit. Based on the expected pH in the open pit, the calcium sulfate sludge is not expected to re-dissolve.
7. Supernatant from the calcium sulfate precipitation process will contain high levels of TDS and dissolved sulfate, a portion of which will need to be removed from the WTP process to avoid continual buildup. The supernatant water will be filtered with UF membranes. UF backwash will be sent to the sludge thickener. UF permeate will be sent to brine concentration RO membranes. Brine concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged.
8. Reject from the brine concentration RO membranes, which will still be a relatively high flow of water with high TDS and dissolved sulfate, will be further processed with a two more identical stages of calcium sulfate precipitation by lime softening, UF membrane filtration, and brine concentration RO membranes. All brine

concentration RO permeate will have alkalinity adjusted as necessary and then will be discharged. Brine from the last stage of RO membranes will be transferred to the open pit.

Water Treatment Plant #3- Closure Phase 3 and Post Closure - Open Pit Stream

Figure 4-7 shows a simplified schematic of the treatment process for the Open Pit Stream within WTP #3 during Closure Phase 3 and Post Closure. Key treatment steps occur in the following sequence:

1. Dissolved metals will be oxidized with potassium permanganate, followed by co-precipitation with ferric chloride. Hydrochloric acid or lime will be added as needed to maintain the water pH for optimal precipitation.
2. Flocculators/clarifiers will be used to separate out the co-precipitated solids. Most of the solids from the clarifiers will be recycled back to the oxidation reaction tanks. The balance of clarifier solids will be thickened and transferred to the open pit.
3. Clarified water will then be treated with sodium hydrogen sulfide, lime, and ferrous chloride to further precipitate remaining metals under reducing conditions.
4. Water from the sulfide reaction tanks will be filtered with sand filters and UF membranes to remove precipitated metals. UF permeate water will be discharged to the environment. Backwash from the sand filters and UF membranes will be thickened and transferred to the open pit.

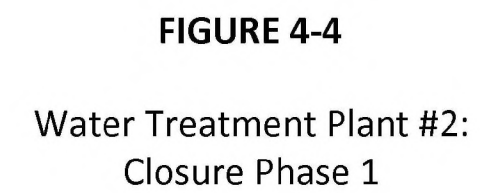




FIGURE 4-5

Water Treatment Plant #3:
Closure Phase 1

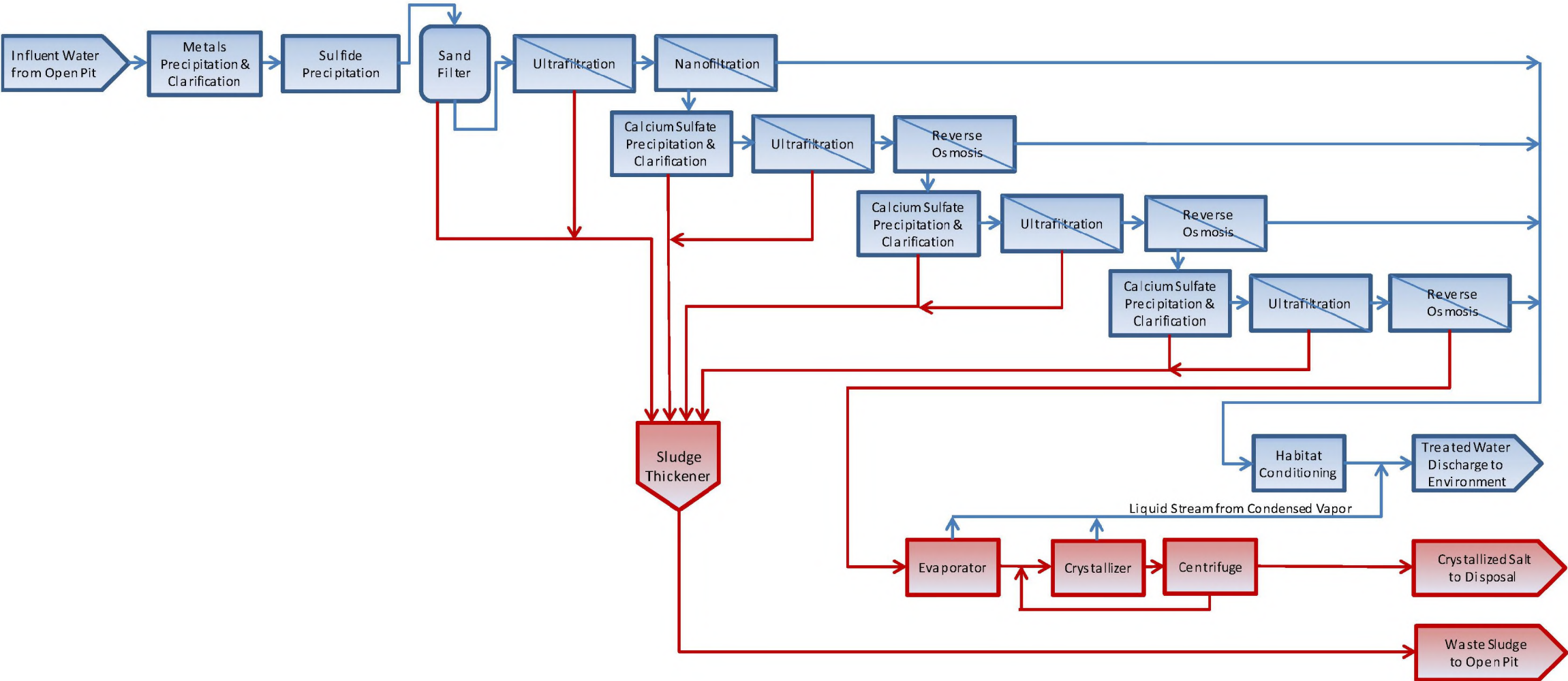


FIGURE 4-6

Water Treatment Plant #3:
Closure Phases 3 & 4 –
Main SCP Stream

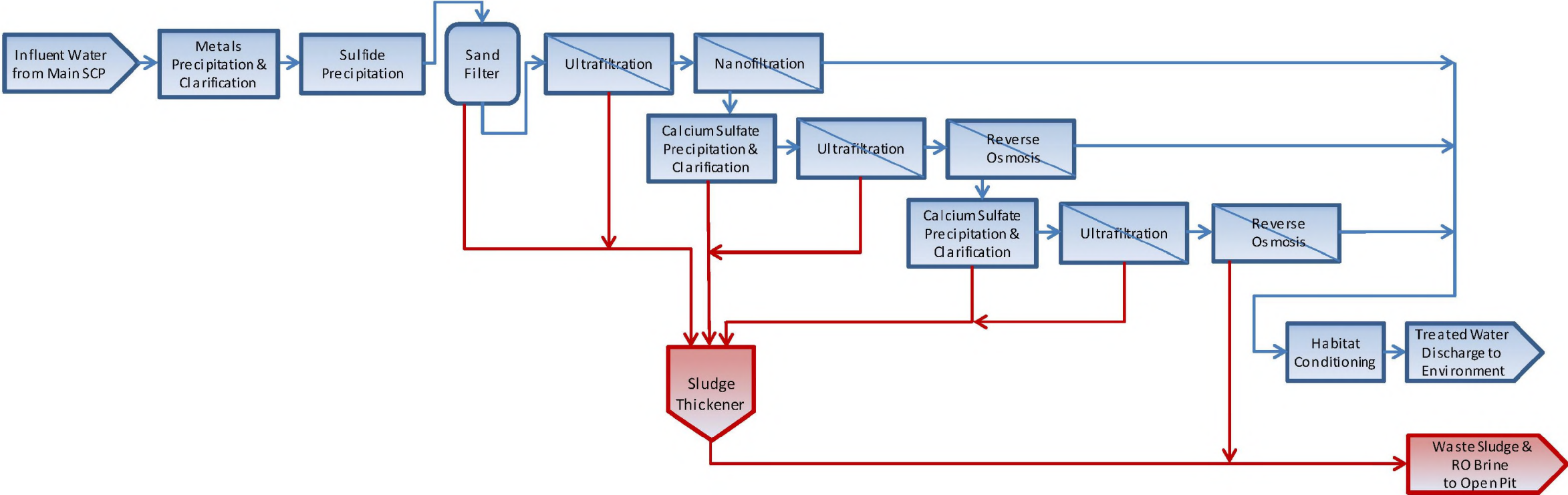
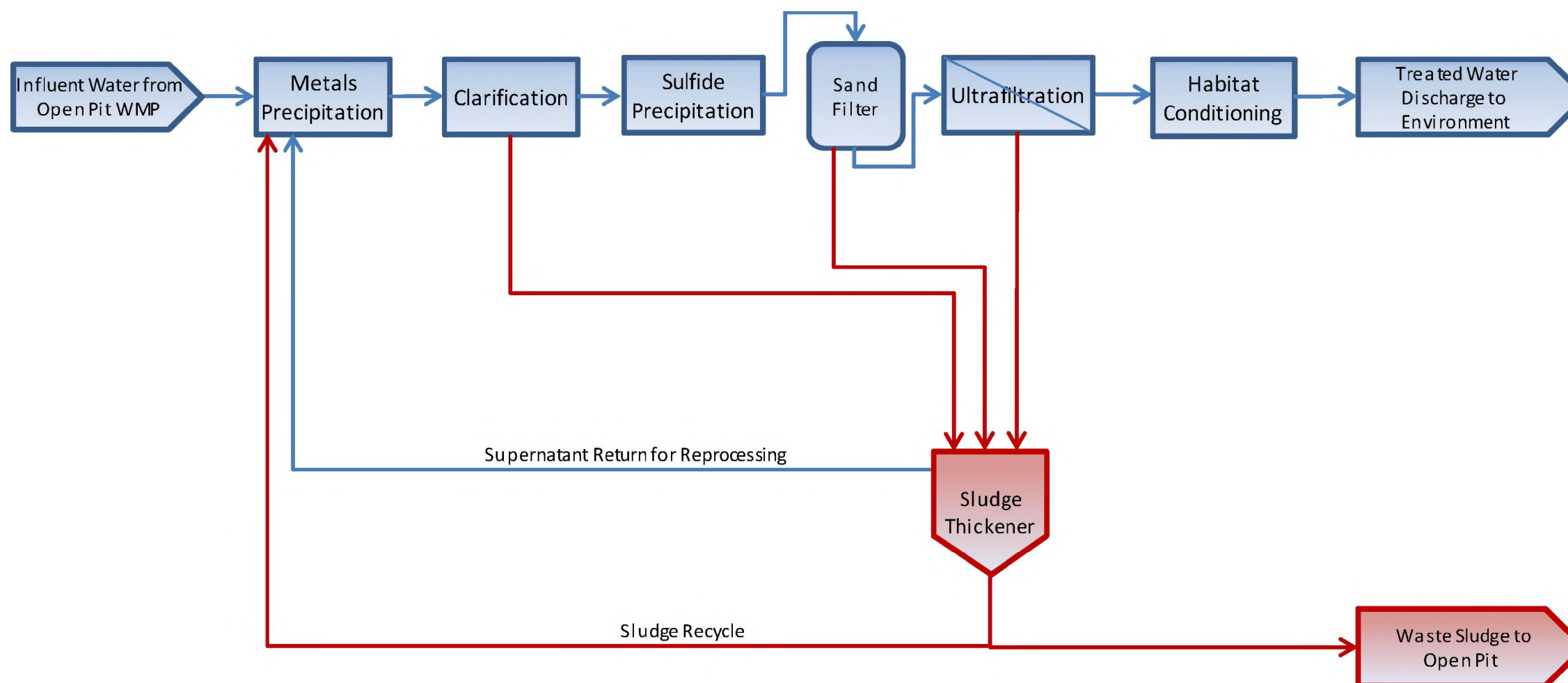


FIGURE 4-7

Water Treatment Plant #3:
Closure Phases 3 & 4 –
Open Pit Stream



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Date: 04/07/2020

Rev: 0

Author: HDR

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5. PROJECT CONSTRUCTION

The Project will take approximately four years to construct. Construction will occur on the four main project components – mine site, transportation corridor, Diamond Point Port, and natural gas line across Cook Inlet, with the focus shifting between these components depending on the stage of construction. Several temporary elements will be built during the Preproduction Phase to facilitate construction of the permanent facilities. These temporary facilities will be either repurposed or removed and reclaimed when construction is complete.

5.1. CONSTRUCTION OVERVIEW

5.1.1. Site Access

Key first steps will be to establish transportation infrastructure to access the site, to install those environmental protection systems that will service the Preproduction Phase, and to construct temporary facilities that enable the construction crews to live and work at the sites.

The initial construction effort will be at the Diamond Point Port. Existing beaching areas at Williamsport and Diamond Point will be used to land equipment and supplies and a temporary camp will be established to support construction. Temporary diesel generators will be used for power supply.

The existing Pile Bay/Williamsport road will be utilized to transport equipment and supplies for initial construction of the road alignment along the north shore of Iliamna Lake while the port facilities and road along Iliamna Bay's west side are being constructed. Additional equipment would be shipped by barge from Pile Bay to Iliamna/Newhalen so that work can commence on the western portions of the access road at the same time. The existing Pedro Bay runway will be used to support initial construction of the access road. No modifications of the runway will be required.

Initial access to the mine site should be complete within one year.

5.1.2. Mine Site

Construction activities will commence at the mine site with completion of the initial access and the construction of temporary accommodation and service facilities. Earthworks will be the primary initial activity. The level of this activity will expand over the next year, with structure construction commencing as the associated earthworks are complete. The focus will be on establishing the process and power plant sites, the open pit WMP, the main WMP, the pyritic TSF, and the bulk TSF. Support facilities, such as accommodations, fuel storage, and power generation, will expand as the site activity increases. Laydown areas and access roads for construction will be placed within the future footprint of the facilities to minimize impacts.

Following on from this, process plant and power plant foundations will be well advanced and equipment deliveries commenced. The accommodations facility will be completed for construction and access roads built. The initial bulk TSF main embankment construction will be well advanced,

with the goal of ensuring that at least one year's worth of water is stored to facilitate process plant startup.

The later construction years will entail significant activity at the site. During this period, the bulk TSF main embankment will be completed, the process plant building erected, and pyritic TSF foundation and liner installed. The WTPs will be ready for initial use and the power plant construction advanced. The initial open pit development will commence with mine service facilities constructed and initial pit dewatering systems installed and operating. Production mining equipment will be delivered and commissioned as required.

A major activity during the final year of construction will be the open pit Preproduction Phase mining. The remaining process and power plant construction will be completed, as will the remaining embankments in the TSF.

5.1.3. Gas, Concentrate, and Water Return Pipelines

The natural gas line installation will be the other major activity occurring during the second and third construction years. Four separate centers will comprise the gas pipeline: the compressor station and transition section on the Kenai Peninsula, the marine section between the Kenai Peninsula and Ursus Cove, the section crossing Ursus Head and the head of Cottonwood Bay, and the overland section along the road. These activities can generally proceed independently of each other, with a target of having natural gas to the mine site by the end of the third construction year.

The concentrate and water return pipelines between the mine site and the port would be constructed at the same time as the road segment of the gas pipeline. Pumping facilities at the mid-point pumping station would also be constructed during this time period.

5.2. COMMISSIONING OVERVIEW

Following construction, the process plant undergoes the following activities to transfer the project from a construction site to a fully operational process plant.

5.2.1. Construction Completion

In the lead up to the completion of the construction phases, pipelines will be pressure tested and all mechanical, civil, structural and electrical installations will be checked to ensure that they are installed according to design and can operate safely. The completions process includes structured and rigorous Quality Assessment and Quality Control procedures to resolve any remaining construction issues prior to pre-commissioning.

5.2.2. Pre-commissioning

This phase involves the testing and inspection of individual plant sub-systems, and associated equipment and facilities to confirm that they are safe and ready for the wet commissioning stage. This includes things such as motor rotations, testing and energisation of power and control systems, field instrument calibrations and adjustments, verification of safety devices and alarms,

and first fills of lubricants. Testing of safety systems may involve unit process emergency procedures and live testing.

5.2.3. Wet Commissioning

During wet commissioning, plant operations are simulated, using water where applicable, to test equipment, piping, instrumentation and control systems, and interlocking to the maximum extent possible prior to the introduction of mineralized material. The water testing will check that fluid systems perform to their design intent and meet their design specifications prior to the introduction of mineralized material during process commissioning.

5.2.4. Process Commissioning

This phase comprises the initial operation of the plant facilities using mineralized material and process reagents. The objective is to have the process plant operating in a steady and consistent manner prior to the ramp-up phase. During this phase, differing results or any unforeseen issues with the scale up from test work to full-scale operation of the process plant will be identified. During this phase, plant or infrastructure modifications, or process reconfiguration, may be required to improve the process or enhance efficiency.

5.2.5. Ramp Up

The ramp-up phase may last several months, during which the process plant will be ramped up to its full design capacity and performance levels. This phase may also entail infrastructure modifications or process reconfiguration as identified by the commissioning and operations teams.

5.3. TEMPORARY FACILITIES

Many of the facilities installed during initial construction activities will be converted to permanent use. However, a number of these will be decommissioned and removed during or following construction.

The initial construction camps at the Diamond Point Port and mine site will likely be fabric-covered or transportable facilities. The construction camp at the mine will be located near the mill laydown area. The construction camp at the port will be located in an area that will be used for port operations and will not require a separate footprint. Temporary camps will be established to support road construction and will remain in place until pipeline construction is complete. Existing facilities in Iliamna and Newhalen will also be utilized. During the exploration phase, PLP employed more than 200 staff in Iliamna/Newhalen in these existing accommodations. Until the access road crossing the Newhalen River is complete, the crews will either be bused on existing roads to their workplaces or shuttled to their workplaces by helicopter.

The temporary construction camp at the mine site will be expanded during the initial phase of construction at this location. Construction crews will utilize this camp and the permanent accommodations complex when it is complete. As construction is completed and crew sizes reduce, they will transition to the temporary camp only. This will enable the accommodations complex to be refurbished to single-room occupancy for the mine operations staff.

All temporary construction facilities will be removed after construction, and the sites, unless being used for permanent facilities, will be reclaimed.

5.4. ENVIRONMENTAL PROTECTIONS DURING CONSTRUCTION

5.4.1. Wastewater and Stormwater

Appropriate ADEC discharge permits or authorizations under general permits will be obtained for all wastewater discharges prior to construction. Stormwater runoff will be properly controlled at all construction sites using structural and non-structural BMPs. No construction will begin without coverage under applicable ADEC general stormwater permits and an approved stormwater pollution prevention plan. Routine inspections and monitoring will ensure the proper functioning of all stormwater BMPs throughout the construction period.

5.4.2. Fuel Management

Fuel management will include appropriate containment and practices, in accordance with ADEC and EPA regulations and approved spill prevention and response plans. Construction equipment and construction-camp power generation will use diesel fuel. Diesel storage will include a variety of tank types and sizes ranging from approximately 10,000 to 50,000 gallons. Aviation fuel for helicopters will be stored at the mine site, Diamond Point Port, and other satellite locations as necessary. Fuel will be distributed to the smaller camps and individual work sites from the main storage locations by fuel truck.

5.4.3. Wildlife Management

PLP will develop a Wildlife Interaction Plan management plans to minimize human-wildlife interactions and resolve conflicts. All employees and contractors will receive wildlife education and training as part of their orientation. The U.S. Fish and Wildlife's national bald eagle management guidelines will be followed to the extent practicable to minimize any potential for disturbance or impacts. A nest relocation or non-purposeful take permit will be requested only when work cannot be limited in the vicinity of a protected nest.

Protection of marine mammals will be addressed through the Marine Mammal Protection Act (MMPA) and PLP will follow the requirements of any authorizations issued under the MMPA.

5.4.3.1 Environmental Construction Windows

Work in anadromous fish streams will comply with Anadromous Fish Act regulations, ADF&G guidance, and ADNR lease requirements. Resident fish will require site-specific protections under the Alaska Fish Passage Act. Stream surveys conducted as part of the environmental baseline studies will inform the establishment of permit conditions. Mitigation measures will be determined during the permitting process.

Ground-clearing activities will be conducted prior to construction work and will be timed to avoid bird-nesting periods in accordance with the U.S. Fish and Wildlife Service's Migratory Bird Treaty

Act guidance. Nesting periods are generally spring and summer but vary according to habitats and species.

5.4.3.2 Helicopter Protocols

PLP protocols to ensure that helicopters and fixed-wing planes do not harass wildlife have been well established during the exploration phase of the project. These protocols, listed below, will remain in place throughout construction and the life of the mine.

- Do not harass or pursue wildlife.
- Fly 500 feet above ground level or higher when possible and safe to do so.
- When wildlife (especially bears, caribou, moose, wolves, raptor nests, flocks of waterfowl, seabirds, or marine mammals) are observed, avoid flying directly overhead and maximize lateral distance as quickly as possible.

5.4.3.3 Hunting and Fishing Restrictions

PLP employees and contractors will not be allowed to fish, hunt, or gather while on their work rotation during the construction and operation of the Pebble Project facilities.

6. CLOSURE AND RECLAMATION

PLP's core operating principles are governed by a commitment to conduct all mining operations, including reclamation and closure, in a manner that adheres to socially and environmentally responsible stewardship while maximizing benefits to state and local stakeholders. PLP has adopted a philosophy of "design for closure" in the development of the Project that incorporates closure and long-term post-closure water management considerations into all aspects of the project design to ensure that all regulatory requirements, as well as private landowner obligations, are met at closure.

Considerations incorporated into the project design include:

- A separate pyritic TSF allows potentially acid generating tailings and PAG/ML waste rock to be relocated into the open pit and stored sub-aqueously during closure, preventing acid mine generation from this material and allowing reclamation of the pyritic TSF footprint.
- Quarried and waste rock will be geochemically tested prior to being used in construction to avoid the potential for contaminated drainage during operations and post-closure.
- Growth media and overburden will be salvaged during construction for use as growth medium during reclamation.
- TSF embankment slopes will be 2.6H:1V to provide long-term stability and facilitate the placement of growth medium.
- The overall project footprint will be minimized to facilitate physical closure and post-closure water management.

Reclamation and closure of the Project falls under the jurisdiction of the ADNR Division of Mining, Land, and Water, and the ADEC. The Alaska Reclamation Act (Alaska Statute 27.19) is administered by the ADNR; it applies to state, federal, municipal, and private land and water subject to mining operations. Except as provided in an exemption for small operations, a miner may not engage in a mining operation until the ADNR has approved a reclamation plan for the operation. The landowner participates in the planning process with regard to determining and concurring with the designated post-mining land use.

6.1. PHYSICAL RECLAMATION AND CLOSURE

The physical site closure work will commence as operations end.

- Active mining stops. Pit dewatering rates will be adjusted to maintain water levels in the pit at levels that provide safe access for placement of pyritic tailings and PAG waste rock.
- Pyritic tailings and PAG waste rock will be placed into the pit for long term storage below water. Once the material has been transferred to the open pit, pit dewatering

will cease and the water will be allowed to rise to the maximum management level. The mill, pyritic TSF, main WMP, and other infrastructure not required for post-closure will be removed and/or reclaimed.

- The bulk tailings will have a dry closure and be allowed to fully consolidate. Once runoff is demonstrated to meet water quality criteria it will be directly discharged to the NFK catchment area. Bulk TSF seepage water will be pumped to the WTP.
- Once the open pit water level reaches the maximum management level, dewatering will recommence to maintain the water level, ensuring inward flow of surrounding groundwater and prevent contact water from getting into the groundwater.
- Once physical closure activities are completed, site access infrastructure will be reconfigured to support long-term post closure activities.

All mill and support facilities not required for post-closure, including the pyritic TSF, main WMP, and open pit WMP embankments and liners, will be dismantled and removed. Concrete pads and foundations will be broken up so that they do not act as an impermeable impediment to water flows. Inert materials will be disposed of in an on-site monofill that will be sited within the disturbed footprint, while others will be shipped off site for disposal as appropriate. Disturbed areas will be recontoured, graded, ripped, and scarified. Topsoil and growth media will be placed as needed, and sites will be seeded for revegetation. Surface runoff from the disturbed areas will be collected and either treated in the WTPs or directed to the pit lake until it is found to be suitable for direct discharge to the downstream drainages.

A spillway will be constructed from the bulk TSF. Late in the operating phase, tailings in the bulk TSF will be spigoted to allow for surface drainage toward the closure spillway. As milling operations cease, free water will be pumped from the surface of the bulk tails, and they will be allowed to consolidate until the surface is suitable for equipment traffic on the surface. The tails will be re-graded as needed to facilitate drainage. A capillary break and growth media will be placed over the surface of the tails prior to seeding for revegetation. Growth media will also be placed on the bulk TSF embankments prior to seeding for revegetation.

Seepage water from the bulk TSF embankment seepage collection systems will be collected and directed to the pit lake.

The road system will be retained as long as required for the transport of bulk supplies needed for long-term post-closure water treatment and monitoring. The concentrate and return water pipelines will be pigged and cleaned before being abandoned in place. Surface facilities associated with the pipelines will be removed and reclaimed. The Diamond Point Port facilities will be removed, except for those required to support shallow draft tug and barge access to the dock for the transfer of bulk supplies. The natural gas pipeline will be maintained until such time as it is no longer required to provide energy to the project site. If no longer required, the pipeline will be pigged and cleaned before being abandoned in place or removed, subject to the regulatory review and approval at the decommissioning stage of the project. Surface facilities associated with the pipeline will be removed and reclaimed.

6.2. POST-CLOSURE MANAGEMENT

The pit lake will fill during the closure period. Surface runoff from the walls will result in leaching of accumulated metals from the walls. The pit lake is expected to stratify during the closure period with surface waters retaining a neutral to slightly basic pH over time. Water quality parameters showing predictions that exceed discharge limits include hardness and several trace elements (Al, As, Cd, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Sb, Se, and Zn). Pit lake water quality will be monitored, and appropriate precautions will be taken to manage wildlife activity on the lake. Once the level of the pit lake has risen to about 890 feet elevation, water will be pumped from the pit, treated as required, and discharged to the environment. By maintaining the water level at this elevation, which is at least 50 feet below the elevation at which groundwater flow would be directed outward from the open pit, upset conditions resulting in an unplanned discharge can be avoided, as there is time to address any problems with the WTP before flows reverse.

Long-term discharge from the bulk TSF seepage collection systems will be pumped to the WTP.

6.3. FINANCIAL ASSURANCE

Prior to commencing construction, the Project Reclamation and Closure Plan approval and associated financial assurance mechanisms will need to be in place. The Reclamation and Closure Plan and financial assurance obligations will be updated on a 5-year cycle in accordance with regulatory requirements to address any changes in closure and post-closure requirements and cost obligations.

A detailed reclamation and closure cost model will be developed to address all costs required for both the physical closure of the Project and the funding of long-term post closure monitoring, water treatment, and site maintenance. The estimate will include the costs of closure planning and design, and mobilization of third-party equipment to site; detailed estimates of equipment and labor requirements for physical closure; capital, sustaining capital, and operating costs for water treatment and other long-term post-closure operations; and appropriate indirect costs and contingencies developed following ADNR guidance.

7. ENVIRONMENTAL PERMITTING

Numerous environmental permits and plans will be required by federal, state, and local agencies. PLP will work with applicable permitting agencies and the State of Alaska large mine permitting team to provide complete permit applications in an orderly manner.

Because the Pebble Project involves a federal permit—U.S. Army Corps of Engineers Section 404/10 permit for the filling of wetlands and placement of structures in navigable waters—the provisions of NEPA will apply to this Project. There are provisions within NEPA, as well as within the permitting processes for many of the individual permits, that will provide for public review and comment on the Project.

Table 7-1 lists the types of permits that are expected to be required for the Pebble Project. Multiple permits of certain types may have to be applied for to accommodate the full scope of facilities.

Table 7-1. Environmental Permits Required for the Pebble Project

Agency	Approval Type	Project-related Examples
Federal		
BATF	License to Transport Explosives	Construction explosives acquisition and use
	Permit and License for Use of Explosives	Construction explosives acquisition and use
BSEE	Right-of-Way Authorization for Natural Gas Pipeline	Subsea natural gas pipeline in OCS waters
DHS	Airport Security Operations Plan	Iliamna Airport
	Port Facility Security Coordinator Certification	Port site
	Port Security Operations Plan	Port site
EPA	Facility Response Plan (required to be submitted to EPA, however EPA does not provide plan approvals)	Fuel storage facilities, fuel transport on the mine roadway
	RCRA Registration for Identification Number	Storage and disposal of hazardous wastes
	Spill Prevention, Control, and Countermeasure (SPCC) Plan (SPCC plans are not required to be submitted or approved by EPA. The plan will be reviewed and certified by a Professional Engineer licensed in Alaska)	Fuel storage facilities

Agency	Approval Type	Project-related Examples
FAA	Notice of Controlled Firing Area for Blasting	Construction and mining blasting activity
FCC	Radio License	Radios
MSHA	Mine Identification Number	Mine site
	Notification of Legal Identity	Mine site
NMFS	Magnuson-Stevens Fishery Conservation and Management Act Consultation documentation	Necessary in areas where mine, road, or port site activity affect essential fish habitat
USACE	Clean Water Act Section 404 permit for Discharge of Dredge or Fill Material into Waters of the U.S.	Fill into wetlands for a variety of facilities at the mine, road, pipelines, port site
	Rivers and Harbors Act Section 10 Construction of any structure in or over any Navigable Waters of the U.S.	Road bridges and causeway; port site docking and ship-loading facilities and maintenance dredging.
USCG	Facility Response Plan	Fuel storage facilities
	Fuel Offloading Plan; Person in Charge Certification	Offloading fuel from barges at the port
	Hazardous Cargo Offloading Plan; Port Operations Manual Approval	Offloading hazardous cargo from ships
	Navigation Lighting and Marking Aids Permit	Port facilities
	Rivers and Harbors Act Section 9 Construction Permit for a Bridge or Causeway across Navigable Waters	Bridge along road
USDOT	Registration for Identification Number to Transport Hazardous Wastes	Transport of hazardous wastes to approved disposal site
USFWS	Bald and Golden Eagle Protection Act Programmatic Take Permit	May be necessary in areas where mine, road, or port site activity may disturb eagles
	Migratory Bird Treaty Act Consultation documentation	May be necessary in areas where mine, road, or port site activity may disturb migratory birds

Agency	Approval Type	Project-related Examples
USFWS/NMFS	Endangered Species Act Incidental Take Authorization	May be necessary at the port site and for sub-sea pipeline construction where activities could disturb northern sea otter, Beluga whale, Steller sea lion, Steller's eider
	Marine Mammal Protection Act Incidental Take Authorization; Letter of Authorization	May be necessary at port site where activities could disturb northern sea otter, Beluga whale, Steller sea lion, harbor seal, Dall's porpoise
State		
ADEC	Alaska Solid Waste Program Integrated Waste Management Permit/Plan Approval	Tailings disposal, waste rock disposal, landfills
	Reclamation Plan Approval and Bonding	Required prior to construction.
	Alaska Solid Waste Program Solid Waste Disposal Permit; Open Burn Permit	Construction waste material disposal
	Clean Water Act Section 402 Alaska Pollutant Discharge Elimination System Water Discharge Permit	Water discharges from water treatment plans at the mine site.
	Approval to Construct and Operate a Public Water Supply System	Mine and port, and construction camps
	Clean Air Act Air Quality Control Permit to Construct and Operate – Prevention of Significant Deterioration	Power plant and other non-mobile air emissions; fugitive dust; applicable to mine, road, and port
	Clean Air Act Title V Operating Permit	Power plant and other non-mobile air emissions; fugitive dust; applicable to mine and road
	Clean Air Act Title I Operating Permit	Non-mobile air emissions; stationary sources, fugitive dust; applicable to port and Kenai compressor station
	Clean Water Act Section 401 Certification	Certification of the Section 404 Permit.
	Clean Water Act Section 402 Stormwater Construction and Multi-Sector General Permit; Stormwater Discharge Pollution Prevention Plan	Surface water runoff discharges at mine, road, and port site
	Food Sanitation Permit	Mine and port, and construction camps

Agency	Approval Type	Project-related Examples
	Oil Discharge Prevention and Contingency Plan (ODPCP or "C" Plan)	Fuel storage and transfer facilities, port and mine
ADF&G	Fish collection permits for monitoring	Required for construction and monitoring
	Fish Habitat Permit	Required for most work in anadromous streams and for most work in resident fish streams that might affect fish passage.
ADNR	Alaska Dam Safety Program Certificate of Approval to Construct a Dam	Tailings dam, seepage control dams
	Alaska Dam Safety Program Certificate of Approval to Operate a Dam	Tailings dam, seepage control dams
	Reclamation Plan Approval and Bonding	Required prior to construction.
	Lease of other State Lands	Any miscellaneous other state lands to be used by the Pebble Project – none identified at this time
	Material Sale on State Land	Materials removed from quarry sites for construction
	Mill Site Permit	All facilities on state lands
	Mining license	All facilities on state lands
	Miscellaneous Land Use Permit	All facilities on state lands
	National Historic Preservation Act Section 106 Review	Area of Potential Effect
	Pipeline Rights-of-Way Lease	Natural gas, concentrate, and water return pipelines on State lands and natural gas pipeline in State waters
	Fiber Optic Cable Right-of-Way Lease	Fiber Optic Cable on State lands and in State waters
	Powerline Right-of-Way Lease	Powerlines to support electric power distribution
	Road Right-of-Way Lease	Road between mine and port site
	Temporary Water Use Permit; Permit to Appropriate Water	Surface and groundwater flow reductions
	Tidelands Lease	Port structures below high tide line
	Upland Mining Lease	All facilities on state lands

Agency	Approval Type	Project-related Examples
ADOL	Certificate of Inspection for Fired and Unfired Pressure Vessels	
ADOT&PF	Driveway Permit	Road
	Utility Permit on Right-of-Way	Natural gas pipeline on the Kenai Peninsula
ADPS	Approval to Transport Hazardous Materials	Transport of hazardous materials along the road
	Life and Fire Safety Plan Check	Mine and port
	State Fire Marshall Plan Review Certificate of Approval	For each individual building
Local		
KPB	Conditional Use Permit	
	Floodplain Development Permit	
	Multi-Agency Permit Application	
L&PB	Lake and Peninsula Borough Development Permit	Mine and road area within the Lake and Peninsula Borough

ADEC = Alaska Department of Environmental Conservation

ADF&G = Alaska Department of Fish and Game

ADOT/PF = Alaska Department of Transportation and Public Facilities

ADPS = Alaska Department of Public Safety

BATF = U.S. Bureau of Alcohol, Tobacco, and Firearms

BSEE = Bureau of Safety and Environmental Enforcement

DHS = U.S. Department of Homeland Security

EPA = U.S. Environmental Protection Agency

FAA = Federal Aviation Administration

FCC = Federal Communications Commission

FERC = Federal Energy Regulatory Commission

L&PB = Lake and Peninsula Borough

MSHA = U.S. Mine Safety and Health Administration

NMFS = National Marine Fisheries Service

RCRA = Resource Conservation and Recovery Act

SHPO = State Historic Preservation Officer

USACE = U.S. Army Corps of Engineers

USCG = U.S. Coast Guard

USDOT = U.S. Department of Transportation

USFWS = U.S. Fish and Wildlife Service